eling cyclones which frequent the North Atlantic, thereby removing a part of the air mass of the HIGH and thus inducing a fall in pressure. When the outflowing winds continue for some time, the level of the barometer sinks and the region of maximum pressure—the crest of the HIGH—is apparently shifted to the south or the west, as the case may be. A shifting of position thus brought about can have little, if any, influence upon the weather of adjacent areas. From this point of view the term "center of action" as ordinarily applied is a misnomer.

The type of weather associated with high temperature in northeastern United States came to an end about the close of July. The change was apparent, in the beginning, in the increase in the depth of cyclonic depressions and a speeding up of their velocity of translation; there was, of course, a correspondingly greater gradient for northerly winds which resulted in the more thorough mixing of the lower strata of the atmosphere and cooler weather. This or a somewhat similar change was observed in Great Britain during the last week of July. Another indication of the change was the sharp fall in the barometer at the Azores on July 26, due, it is believed, to the influence of a northern depression, which at the moment was passing to the eastward over Iceland. The fall in pressure over the Azores indicated first of all that cyclones for the time being, at least, were taking a lower course than formerly, and this fact is always significant in weather forecasting.

It may be recalled that nothing has been developed in the foregoing discussion which would indicate the underlying cause of the very pronounced variation in the mean temperature of January, February, and March, 1921, although the suggestion has been made that the changes in surface cover induced by the continued high temperature of January and February would doubtless strongly influence the weather of subsequent months.

The most pronounced disarrangement of the normal distribution of the meteorological elements during the months of January and February, 1921, was in the pressure distribution. Roughly speaking, it would seem as if the belt of high pressure which encircles the globe about north latitude 35° was temporarily displaced to the northward, and this in turn was responsible for the eastward movement of cyclones in higher latitude than in a normal period. We may then assume that the disturbance which was most pronounced in January, 1921, and was apparently more than local in nature, must be influential in giving character to the weather until once more the normal distribution is restored. It may be seen from Chart VII of the February, 1921, REVIEW that mean pressure for that month still continued relatively high in southern districts of the United States and that the region of maximum pressure for the month appears on the Pacific rather than on the Atlantic coast, as was the case in the previous month. There is no question but that the abnormalities of temperature and precipitation which we have discussed were primarily due to the pressure distribution, but that knowledge brings us no nearer to a solution of the riddle of seasonal weather forecasting.

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THE DEFINITION AND SCOPE OF CLIMATOLOGY: WHEREIN IT IS TO BE DISTINGUISHED FROM METEOROLOGY.

By L. W. C. BONACINA.

[Author's Abstract.]

[27 Tanza Road, Hampstead, London, N. W. 3, July 2, 1921.]

The ordinary distinction which is drawn between meteorology and climatology is vague, and a definition based on sound philosophical principles is needed which will be of practical use for purposes of classification. Climatology is shown to comprise the regional aspects of meteorology; it is Regional Meteorology, and as such the theoretical distinction between the two studies of the atmosphere is in the point of view rather than in the subject matter. If once this theoretical distinction is grasped, it will be found a reliable guide in deciding whether a given subject, problem, or proposition in the science of the earth's atmosphere should be regarded as essentially meteorological or climatological.

Pure meteorology is a part of geophysics. Climatology, on the other hand, involves geographical relationship, and it is shown that a meteorological subject is "climatological" to the extent that interest centers round the locality and reason of weather events. Defined thus on broader lines, climatology is not a mere subsidiary branch of meteorology as is so often stated, but is a collateral aspect of the science of the atmosphere, constituting *regional*, as opposed to *pure*, meteorology. Pure meteorology treats of weather processes as a set of physical changes; climatology is concerned with them as the expression of regional and seasonal influences, involving geographical comparison with other regions. It is clear, further, that in so far as climatology not only describes, but also explains, regional weather it can be built up on a firm basis of geophysics.

Finally, it is indicated that Regional Meteorology or Climatology, in so far as it is a subject which is particularly interested in seasonal periodicities of weather, ought really to be regarded as a study not merely in three, but in four, dimensions, viz—north-south, east-west, up-down, summer-winter—as specified respectively by latitude, longitude, height, and date. (In this connection see also the author's note on "Definition of geography" in *Scot. Geo. Magazine*, April, 1921.)

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CLIMATE DEFINED: ITS CONSTITUENT ELEMENT CAUSATIVE FACTORS.

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Climate is defined as average regional weather, the term average being used in the true mathematical sense to include the less common, as well as the more common, phases or weather. Thus "climate" really represents a kind of frequency distribution of weather types and phases in a given region. Any phase of weather is an expression of climate. It is pointed out that nearly all writers tend to confuse the notion of a *constituent element* of weather and climate with that of a *causative factor* of the same. The several well-known primary factors which cause or determine the distinctive climate of any region on the earth's surface are briefly reviewed and classified under the following minimum number of categories: (1) Solar constant of radiation, (2) latitude, (3) altitude, (4) land and water distribution, (5) wind belt, (6) land relief, (7) soil conditions, etc., (8) occasional influences, such as volcanic dust in the upper air. The physical effect which these climatic factors individually exert is fairly well understood, but No. 5 is singled out for special consideration in relation to the scope of climatology and forms the topic of the following paper.